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*Courtesy Albany Knickerbocker News*

*Commissioner Graves Greets Distinguished Scientists*
*Left to right: Dr John C. Merriam, Dr Alexis Carrel, Dr Frank P. Graves*

# Convocation Celebrates Centennial of State Museum

The relation of science to the State and to society was stressed by the speakers at the Seventy-third Convocation of The University of the State of New York which was held on October 15th in Chancellors Hall of the State Education Building. The Convocation celebrated the one hundredth anniversary of the establishment of the Division of Science and State Museum. The distinguished scientists and interpreters of science who spoke at the afternoon and evening sessions paid tribute to the Museum staff for past achievements and predicted that with adequate support even greater contributions would be made in the future.

The afternoon session was called to order by Regent William Leland Thompson, chairman of the Convocation committee. At the opening of the Convocation Chancellor Thomas J. Mangan and Vice Chancellor William J. Wallin were inducted into office by Chief Judge Frederick Evan Crane of the Court of Appeals. The invocation was pronounced by the Very Rev-

erend Edward R. Welles, dean of the Cathedral of All Saints in Albany. Chancellor Mangan then welcomed the visitors in brief remarks referring to the important activities carried on by the State Museum. Addresses at this first session were given by Dr John C. Merriam, president of the Carnegie Institution of Washington; Dr C. Stuart Gager, director of the Brooklyn Botanic Garden; and Lewis Mumford, author, of New York City.

Speaking on the subject "Influence of Science upon Appreciation of Nature," Doctor Merriam declared that a great responsibility rests upon those who follow the advances of science "to see that we grow in the joy of appreciation of nature as knowledge advances." The contributions of the New York State Museum in adding to knowledge in natural history are outstanding not only for the country but for world science, he said, as he paid tribute particularly to Dr Charles C. Adams, the present Director, and to Dr John M. Clarke, his predecessor. "The peculiar conditions of location, support and consistent constructive policy here through the century of continuing work have made exceptionally large contribution to culture and its living uses," he concluded.

Doctor Gager devoted the major part of his address on "The New York State Museum: One Hundred Years Young," to the work of two former botanists on the State Museum staff, Dr John M. Torrey and Dr Charles H. Peck, "whose contributions during its first 75 years laid indispensable foundations and made both them and this Museum favorably known throughout the scientific world." Discussing the value of such investigations, he declared: "There has never existed and does not now exist a great industry or a commercial activity that does not owe its existence or its continuing prosperity to the fact that some one, some time, endeavored to find out something for the sheer pleasure or satisfaction of knowing it." He added: "There is nothing more important for the welfare of a people than the advancement of knowledge — nothing more important for a great state to do than to promote this activity, to organize it and finance it commensurately with its importance."

The regional survey, defined as "a systematic study of a whole area not solely as a geographic area but as a theater for human activities," was held forth by Mr Mumford as the solution of the problem of making the sciences intelligible. His subject was "Regional Survey: Science for Citizenship." "What we need," he said, "if our democracy is to become a working reality once more is a whole generation trained systematically to deal with the many-sided realities of modern life... Every part of our educational routine must be revised until the world of knowledge itself is sufficiently unified to be a coherent and clarified reflection of the world which is understood and will in turn be modified by that knowledge."

The evening session opened with an academic procession into the auditorium. Chancellor Mangan presided, and addresses were given by Dr Arthur E. Morgan, chairman of the Tennessee Valley Authority, and Waldemar B. Kaempffert, science editor of the New York Times. These addresses were followed by the conferring of the honorary degree of doctor of science upon Doctor Merriam and Dr Alexis Carrel, of the Rockefeller Institute for Medical Research.

Speaking on the subject "The Relation of Electricity to Social Policy," Doctor Morgan stressed the importance of power as one of the major factors in social progress. Pointing out that undertakings to control water resources are growing to such complexity and size that they can be handled only by government, he explained various methods that have been used by government to insure that "this great force shall realize its full possibilities." The Tennessee Valley Authority, he declared, is an experiment in the field of democratic government in electric power, but he insisted that neither private industry nor public ownership is fully satisfactory but that both have important contributions to make.

A warning that science is in danger because of the attacks on democracy was sounded by Mr Kaempffert in his address on "Science and Democracy." Explaining that science and democracy are intimately related, Mr Kaempffert declared that the great discoverers and experimenters of the past were free in that they were members of a democratic society that believed in following its own impulses. "Today this freedom is threatened because democracy is threatened," he said. "If one falls the other falls."

"If democracy is to be saved," he concluded, "it must be with the aid of science. By this I mean that the scientific objective attitude must rule in place of the political attitude."

The benediction was pronounced by the Right Reverend Monsignor John T. Slattery, pastor of St Joseph's Church in Troy, and the Convocation was closed by Chancellor Mangan.

Following the evening session the Board of Regents and the President of The University tendered a reception in the Rotunda. The reception was followed by a tour of the exhibition halls of the State Museum.

Music for the sessions and the reception was provided by recordings reproduced on the Scott "Philharmonic" radio, a 30-tube radio and phonograph combination which is a creation of the E. H. Scott Radio Laboratories, Inc., of Chicago and New York.

Abstracts of the Convocation addresses follow:

# Excerpts from Convocation Addresses

## OPENING OF THE CONVOCATION

CHANCELLOR THOMAS J. MANGAN

This year we celebrate the centennial of the beginning of the State Museum and state science work and as a subordinate theme, the twenty-fifth opening of the State Education Building, a structure unique in its beauty and, until a few years ago, the only separate educational building in existence.

The Museum and science work began with the establishment by the Legislature of a State Geological and Natural History Survey 100 years ago. This was not only the first scientific agency to be founded by the State of New York, but was one of the earliest in the United States under any auspices, and geological and biological activities of the State have remained in the forefront every since. Other progressive states following New York subsequently began to make similar provision for the scientific study of their natural resources, but no other has developed in its work on a scale comparable with that represented by the Division of Science and Museum located in the State Education Department of New York.

From this beginning New York had by 1870 published the most important account of its natural resources in the State. These volumes are today found in the leading libraries throughout the world. The State's favorable geographic position and its unique and able scientists have permitted this early geological work to merit the glowing eulogy written by Dr George P. Merrill of the United States National Museum. Doctor Merrill says, concerning the founding of the survey:

This led to an organization which has left a more lasting impression upon American geology than any that has followed or had preceded it. As fate ordained, the locality was one of the most favorable that could have been selected for working out the fundamental principles of stratigraphic geology; moreover, those appointed to do the work proved equal to the occasion. The New York survey gave to American geology a nomenclature largely its own; it demonstrated above everything else the value of fossils for purposes of correlation, and incidentally it brought into prominence one man, James Hall, who was destined to become America's greatest paleontologist.

However, the State of New York has never been able to restrict its attention solely to geological studies, but has made extensive investigations in a large number of natural history fields, covering mushrooms, flowers, insects, beneficial and otherwise, birds, fishes and reptiles. The life and history of New York Indians have likewise received attention and a portion of the Museum is given up to the Indians, and extensive historical collections have been made in various New York industries.

These activities have led to a variety of collections and exhibitions in the Museum which have each year attracted an enormous number of visitors. Each year from 400 to 500 school classes, with their attending pupils, students and teachers, come to the Museum from most of the counties of the State. During the summer thousands of tourists from in and out the State visit these exhibits. Another important activity of the Museum is the recent publication of scientific and informative material, and of late years, several hundred have been published in technical and popular form. These treatises are distributed and exchanged throughout the world, and by this means a great number of valuable public documents have been added to the reference libraries of the Education Department, which are of the greatest value to the government departments in the State and the public in general and are constantly used.

# INFLUENCE OF SCIENCE UPON APPRECIATION OF NATURE

DR JOHN C. MERRIAM, PRESIDENT, CARNEGIE INSTITUTION OF WASHINGTON

Over the ages, influence of nature upon man and appreciation of nature by mankind have been extremely important elements in human life. Great advances of science in modern times having made it possible to reach far beyond the range of vision and understanding previously possible, one might expect that nature appreciation would increase in importance and in its contribution of human satisfaction. But so varied have been the appraisals of present-day values in nature appreciation that it has seemed worth while to examine the subject on an occasion such as this, when consideration is given to advance of science in close relation to cultural progress over a period of many decades.

While modern developments in nature study, acquisition of natural parks, and the featuring of conservation might be assumed to indicate that appreciation of nature has a place of exceptional importance in life today, we find recent students of the nature problem stating that in much literature earth and the stars are now regarded as scenery or setting; and that "the present-day poets have given up nature, having found it bankrupt."

Recognizing what appears a failure in ultra-modern literature, and in some measure in modern art, to attain the levels of nature understanding and appreciation of earlier periods, and recognizing also the natural tendency to emphasize achievement in man's creative work, I am approaching this discussion with the purpose of considering whether appreciation of nature may not maintain its place of high human value by reason of the contribution by science rather than in spite of it. May we not expect that the widening and deepening vision of nature will bring us to points of view where new glories can be glimpsed, and even more satisfying relations established?

A great responsibility rests upon those who follow the advances of science to see that we grow in the joy of appreciation of nature as knowledge advances.

As an illustration of the possibilities for advancing appreciation of nature the Grand Canyon of the Colorado River offers especially interesting examples of progress by aid of scientific study.

The Grand Canyon is a magnificent spectacle merely as magnitude, or as color, or as illustration of architectural and pictorial patterns, but perhaps more than in any other way it has human value as a means of indicating what change, movement and time are, and how they present a background for all human thought and purpose and planning. Without such an appreciation of perspective in depths or height, or of the streaming movement in the currents of change, there is no possibility of reaching even an approximation to vision regarding great events or affairs, whether they concern nature, mankind alone, or man in the world where he is placed, or even humanity in the world it is proceeding to make for itself.

The great number of unusual qualities expressed in nature at the Grand Canyon of the Colorado may seem to satiate one's interest in natural features to such extent that enhancement of appreciation by the contribution of science would seem superfluous. And yet there are few places where more numerous or more insistent questions are raised concerning the meaning of the world around us.

While it may appear sufficient merely to accept the Canyon as something that stimulates the imagination, the mind immediately reaches out to inquire concerning its origin. Was the earth here pulled apart along the line of that tortuous fissure marking the course of the river? Was the Canyon produced by earthquakes or through wear of water? Given adequate time and opportunity for investigation, answers to these questions could probably be obtained by the average mind. Science possesses no magic formulas or methods, but is only the accumulated result of intensive organized inquiry concerning such questions.

One sees the picture of nature there so defined as to include elements of magnitude even more stupendous than those of height and depth which impress themselves upon us so sharply in first visions of the canyon. In addition to height and depth and mass as superficial characters, scientific examination makes clear to us the elements of vast power involved both in building the walls and in cutting the canyon. We see time also, represented by stretches that appear almost infinite compared with the limits of experience with which we

*Dr John C. Merriam*

have acquaintance. Still more intimate examination reveals embedded in this record the story of life through the ages with its evolution from stage to stage. To the eye of one who views the picture as a whole, this succession of realities inevitably appears as a continuous story enacted as it were in the presence of the beholder.

The evident contribution of science, both to understanding and to appreciation of nature, brings a responsibility to those who represent science for so directing its effort as to bring to humanity not only knowledge but with this appreciation or enjoyment. It is natural that eagerness for advancement of knowledge by the intensive methods of specialized science leads in the great majority of cases only to technical record of what is discovered. But somewhere in the current of advancing learning it is important that there develop such interest in the interpretation of results as will make these contributions available to all who obtain enjoyment in contemplation and appreciation of nature.

It will be in considerable measure the responsibility of science to make known the values, scientific, economic, and human, in primitive and other less favorable areas of nature. It is also a responsibility of science to cooperate in development of all those modes of human expression that concern the values represented. Not until we have science, art, poetry, philosophy, and religion concentrating their united interest on study of nature shall we have full value from the gifts that it holds for man. In reality a considerable portion of the greatest literature touching nature represents just this combination of values. That such statements have frequently come through ideas of the poet does not mean that they are unscientific; it may signify only that they have been expressed in humanly acceptable form.

Influences exerted by scientific agencies represented here through the Natural History Survey, Geological Survey, State Cabinet of Natural History, New York State Museum of Natural History, The University of the State of New York and State Department of Education have affected differing human interests and activities of the country in more ways than we can catalog adequately. However large the values may bulk in influence concerning what appear to be dominating factors in life, such as maintenance of existence and opportunity for progress, there is reason to feel that advance of understanding and appreciation of the natural world about us are second in importance to no other contributions.

What has been done by these institutions in adding to knowledge in several divisions of natural history is an outstanding contribution not only for this country but for world science. In a quite unusual way the facts and their interpretation have been related to formulation of what we call natural laws and to advancing understanding and appreciation of our natural environment. There have been few investigators in American natural science who have attained as high a rank of scholarship as interpreters of the earth sciences as John M. Clarke, Director of the Museum from 1904 to 1925. Charles C. Adams, the present Director, who followed Clarke in 1926, has exerted wide influence through forwarding the understanding of nature both primitive and domesticated, and by so linking purely factual science to art and to human interest as to better appreciation of nature and increase our joy of living.

More careful analysis than it is possible for me to give will show that the peculiar conditions of location, support and consistent constructive policy of these institutions here through the activities of this century of continuing work have made exceptionally large contribution to culture and its living uses.

# THE NEW YORK STATE MUSEUM: ONE HUNDRED YEARS YOUNG

DR C. STUART GAGER, DIRECTOR, BROOKLYN BOTANIC GARDEN

In any historical account of this institution it will always be essential to mention the work of two botanists — Dr John M. Torrey and Dr Charles Horton Peck, whose contributions during its first 75 years laid indispensable foundations, and made both them and this Museum favorably known throughout the scientific world.

In studying the botany of a new region, such as New York State once was, the first requisite is to know what the plants are that compose the regional flora, and the early publications of the Museum were "Catalogues" of the plants growing spontaneously in various parts of the State. It is of interest to note that the second of these published in 1833, was by a pupil of Torrey, a young man named Asa Gray, who, in time, became the best known and, according to some, the greatest American botanist.

The second great staff botanist was Doctor Peck, whose long series of 46 annual reports, covering the years 1867–1912 inclusive, were known throughout the scientific world as "Peck's Reports." Each was an important contribution to our knowledge of New York State fungi and to the general subject of mycology.

He described about 2500 species of fungi new to science, the majority of them from specimens collected by himself. For much of his career he had quite inadequate support and a salary that was meager. His writings will always have to be consulted by anyone who undertakes further work on the fungi; they are not exceeded in importance by those of any other American student.

It should never be lost sight of that the credit for the superb work of this Museum is due in largest measure to the members of its scientific staff. The work of these men was little understood and of only slight interest to the appropriating powers, who were little concerned as to whether the quarters were adequate; and the compensation was based, not on the value to the State of the services rendered, but on the principle of paying only as much as was absolutely necessary. That the State was able to obtain and hold the services of these men was due solely to their devotion to science and its high ideals.

With reference to the "pure science" work of this Museum the question has, no doubt, already occurred to some, "What is the good of knowing all that? Why should a great State spend any money for the study of its wild flowers, or especially of its toadstools and mushrooms?" That question has always been asked and always will be asked, and it will forever be a responsibility of science to try to answer it. Those who ask it are apt to be most readily satisfied by an answer that shows some economic gain resulting from the new knowledge. There is not time here to point out in detail the advantage to practical agriculture of studies of plant breeding, plant diseases, and botanical soil organisms. According to the statistics of the United States Department of Agriculture, the savings from loss and the gains in production are measured in hundreds of millions of dollars a year.

And we could summarize the very interesting story of how botanical science has served human needs in helping to solve the problems of soil erosion in the "dust bowl" and elsewhere, of the purification of water supply to our cities, the preservation of sea beaches, the diseases of fruit, vegetables and food fishes, the breeding of new and improved fruits and vegetables and flowers, and in other ways, not forgetting the improvement of our minds and the enrichment of life.

There has never existed, and does not now exist, a great industry or a commercial activity that does not owe its existence or its continuing prosperity to the fact that some one, some time, endeavored to find out something for the sheer pleasure or satisfaction of knowing it.

Science advances both "by leaps and bounds," and by the steady plodding of trail blazers along uncharted pathways. The "leaps and bounds" are few and far between. They are the contributions of the great intellects that appear only at intervals, and first catch the vision toward which the blazed trail has been leading. They give from time to time the necessary new impetus to the great army of trail followers (investigators), who plod along, many without a particle of genius, collecting facts for the inspired fertilizing synthesizer, whose formulation of some great new conception rejuvenates the work of science and provides the program of scientific research for another generation or so.

*Dr C. Stuart Gager*

But there is another important consideration, seldom referred to, in discussing the value of accurately observing, describing, and classifying natural objects — such, for example, as Torrey, Gray, Peck and others have done for the flora of New York State. This work supplies the atoms and molecules which are indispensable for building up the great mass of botanical knowledge, which is essentially not a mere accumulation of facts, but a body of concepts — of laws and principles. It is such work as theirs that makes it possible for us to think at all, and to exchange thought.

If it is of any importance for us to have an accurate and comprehensive knowledge of plant life, of nature as a whole, then we must recognize how indispensable it is to have the foundations securely laid by the painstaking work of those who provide the essential underlying data; who can and will devote their time to accurate, thorough and unprejudiced observation and description. They supply the knowledge which is the basis of understanding, which is the essence of science.

If a great State is fortunate enough to find some one able and eager to devote his life to studying the fungi of the State, as Doctor Peck did, it should by all means encourage him and subsidize him. If no one had ever studied fungi, we should have had no yeast, which is a fungus. Whole industries based upon the process of fermentation would never have existed.

But the point I wish to stress is this: Parallel with education, there is nothing more important for the welfare of a people than the advancement of knowledge — nothing more important for a great state to do than to promote this activity, to organize it and to finance it commensurately with its importance. It is correlative with the promotion of law and order, and morals and religion.

A museum is an organic thing. Its germ is an idea. Its essential characteristic is activity and growth. It depends upon nourishment. It remains useful only so long as it continues to perform vital functions. Those who have labored through the first brief hundred years of its life have only laid foundations; but like the foundations of a building, they largely determine the form and proportions of the superstructure.

This is the purpose of anniversaries — not primarily to exult over the past, however glorious it may be, but to make sure that the work of tomorrow shall rest securely on the foundations that have been laid, and by a brief survey of the accomplishments, and especially the personalities of the past, to gather new inspiration and vision for the work that must go on, and on, and on — so long as anything remains unknown and mankind retains its God-given desire to know. These are the eternal prerequisites of science and education.

Let us not be impressed with the idea that the New York State Museum is 100 years *old*; it is 100 years *young*. May the promise of its youth and the need of its services, as well as the invaluable accomplishments of its past, impress the powers that be to provide the necessary funds, not only for the more nearly adequate building which it merits, but to continue its record of a scientific and educational staff of the most able men to be had, who will effectively carry on the glorious tradition of personalities and accomplishments which have commanded the admiration and respect of the learned world for the past hundred years. No money could be appropriated by the legislature of any state that could have fuller justification or yield larger returns on the investment.

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The University of the State of New York

Bulletin to the Schools

Issued semimonthly during the school year by the State Education Department

CHARLES F. PROBES, *Editor*

This bulletin is sent without charge to all schools and educational institutions of the State. To others it will be mailed postpaid for 50 cents a year, 5 cents for single copies.

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NOVEMBER 1, 1937

## Regents Honor Two Scientists

The honorary degree of doctor of science was conferred by the Regents of The University of the State of New York upon Dr Alexis Carrel, of the Rockefeller Institute for Medical Research, and Dr John C. Merriam, president of the Carnegie Institution of Washington, at the closing session of the Seventy-third Convocation of the University on October 15th.

Doctor Carrel was presented for the degree by Dr Grant C. Madill, of Ogdensburg, Regent of the University. Doctor Merriam was presented by Regent George Hopkins Bond, of Syracuse.

The degrees were conferred on behalf of the Regents by Dr Frank P. Graves, President of the University and Commissioner of Education. His remarks in conferring the degree upon Doctor Carrel follow:

ALEXIS CARREL: Gifted with broad powers of imagination, and ingenious, deft and precise in technic and procedure, you have brilliantly conceived of scientific problems for experimental study and have opened and explored new fields in physiology, pathology, medicine and surgery. Your revelations concerning the human organism, its preservation and improvement, have been at once most uncanny and most benign. A daring philosopher and an avid mystic, you have delved into the very foundations of human life and welfare, and have reinterpreted and applied to modern conditions the old *dictum* of Plato that "all philosophers should be kings or else all kings should be philosophers." Your discoveries and writings alike entitle you to be regarded as a genuine benefactor of the race.

To the many degrees, prizes, medals and decorations you have already received, the Regents of The University of the State of New York wish to add their own recognition and have delegated to me the honor of conferring upon you the degree of doctor of science. In testimony whereof I present you with this diploma and place upon your shoulders our royal purple and gold.

In conferring the degree upon Doctor Merriam, Commissioner Graves said:

JOHN CAMPBELL MERRIAM: Interpreter of Nature's handiwork, you have claimed the entire world as your field of investigation, and your findings have become authoritative for all students interested in earth history and the appreciation of natural resources. Evolutionist and paleontologist, you have written the epic of vertebrate life, and have revealed the historic traces of that most finished product, the *homo sapiens*. Humanist and reformer, you have constructively discussed the popularization and promotion of science and the application of scientific methods to the social and governmental affairs of mankind. Your influence in expanding human vision and in developing human wisdom has been felt throughout the length and breadth of the land.

> Happy is the man that findeth wisdom,
> And the man that getteth understanding.
> For the gaining of it is better than the
> gaining of silver,
> And the profit thereof than fine gold.

Already honored with degrees and offices from many leading universities and scientific societies, The University of the State of New York also desires to honor you, and by its authority I have the pleasure of conferring upon you the degree of doctor of science and of investing you with the appropriate academic hood.

Regent Madill's remarks in presenting Doctor Carrel follow:

MR PRESIDENT: On behalf of the Board of Regents, I take great pleasure in presenting for an honorary doctorate in science the well-known savant and investigator, Alexis Carrel. Born and educated in Lyons, France, Doctor Carrel came to the United States a generation ago and has made all his world-famed discoveries here. He early achieved a wide repute for his success in suturing blood vessels and transplanting organs from one part of the body to another and even to another body, without loss of function. These discoveries led to effective methods of blood transfusion, now daily employed throughout the world as a life-saving device. His discoveries have likewise been supplemented through the perfection of an artificial heart to pump life into various vital organs and enable them to be developed and observed outside the body. Cells and tissues have thus been cultivated in glass, as illustrated by the chicken heart that has for a quarter century been kept alive and growing in a tube of nutrient blood manufactured in Carrel's own

laboratory. Simiarly, various tissues too small to be seen under a microscope, have now been made to grow outside the body and be studied by implanting them on living tissues.

Doctor Carrel is a fellow or correspondent of the American Medical Association, the American Surgical Association, the American College of Surgeons, the American Society of Physiology, the Society of Experimental Pathology, the Society of Experimental Biology, the American Philosophical Society and various foreign academies and institutes. He has contributed illuminating reports to all the leading American, English, French and German journals of medicine, surgery, physiology, pathology, gynecology and obstetrics. His recent book upon Man, the Unknown, in which he has urged the possibility of advancing the physical, intellectual and moral welfare of humanity through control of a high council of physicians, has been issued in the hundreds of thousands and translated into all civilized tongues.

Doctor Carrel has been the only scientist in America to receive the Nobel prize in medicine. He has likewise won the Nordhoff-Jung Cancer prize and the award of the National Institute of Immigrant Welfare, has received the Distinguished Service medal for his work in the World War, and has been decorated as Commander in the French Legion of Honor. The honorary doctorate has already been conferred upon him by Columbia, Brown, Princeton, Belfast and other American and European universities. While in the abstract Man is the Unknown, Doctor Carrel as an individual has done so much to throw light on some of the darkest problems of life and thought we feel that we know him. I gladly present Alexis Carrel for the degree of doctor of science, *honoris causa*, from The University of the State of New York.

In presenting Doctor Merriam Regent Bond said:

MR PRESIDENT: I take pleasure in presenting for the honorary degree of doctor of science the president of the Carnegie Institution of Washington, John Campbell Merriam. President Merriam beyond his graduate education at the University of California and while still in the early twenties was awarded the degree of doctor of philosophy by the University of Munich. Before assuming the presidency at Washington, he served at California most successfully for more than a quarter century as professor of paleontology, and eventually was appointed dean of the faculties there. Since he came to the Carnegie Institution, honors have been showered upon him thick and fast. The doctorate in science has already been conferred upon him by Columbia, Princeton and Yale universities, while Wesleyan, California, New York, Michigan and Harvard universities have recognized his services with the degree of doctor of laws. Last year he was awarded the Gold Medal of the American Institute, probably the most coveted distinction that can come to a scientist in this country.

Among dozens of official positions in our leading scientific organizations Doctor Merriam has served as chairman of the National Research Council, as councilor of the National Academy, as regent of the Smithsonian Institution, as president of the Pacific Division of the American Association for the Advancement of Science, as president of the Geological Society of America, and as president of the American Paleontological Society, and he is a fellow and correspondent of innumerable associations of scientists both in the United States and Europe.

Doctor Merriam is the author of a dozen books and hundreds of papers embodying his geological and paleontological researches and his views on education, sociological and philosophical subjects. Besides his own personal investigations and writings, as president of the Carnegie Institution he is responsible for the work of the great departments of scientific research within the institution and for prolific results obtained through others at a hundred universities and seats of investigation throughout the country. His contributions to the interpretation and appreciation of nature and to education have included the popularization of science, the appreciation and protection of the national and state parks, the conservation of the natural resources and the application of scientific methods to human institutions. Thus the contributions of John Campbell Merriam to the development of science and its application to human life have been of the broadest, most profound and enlightening character, and clearly entitle him to his standing as one of the greatest scientific leaders known in American history.

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## Regents Make Appointments to Council on Health

The Board of Regents at its regular meeting on October 15th approved the following reappointments and appointments on the Advisory Council on Health and Physical Education: Daniel J. Kelly, superintendent of schools, Binghamton, and Herman J. Norton, director of physical education, Rochester, reappointed for terms of three years each; Dr Augustus J. Hambrook, Troy, appointed to succeed Dr Floyd S. Winslow, Rochester; Mrs May E. Barnard, East Williston, appointed to succeed Elizabeth L. Sears, Blue Point; Dr Gilbert D. Forbes, Kendall, appointed to succeed Dr Richard W. Weiser, Kenmore, each for terms of three years.

## Prison Inmate Inspired State To Start Science Work

The story of a prison inmate who became such a famous and popular botanist that at the invitation of the Governor he addressed the New York State Legislature and by his eloquence inspired the starting of the State's first scientific agency, was related by Dr C. Stuart Gager, director of the Brooklyn Botanic Garden, in his address at the Seventy-third Convocation of The University of the State of New York. The Convocation celebrated the one hundredth anniversary of the New York State Museum, which is the direct descendant of that first scientific agency — the State Geological Survey. Doctor Gager's story follows:

I will tell you a true story that is stranger than fiction. In 1818 there was a botanist, named Amos Eaton, who had acquired a wide reputation as a "popular" lecturer on botany and other natural history subjects. So great was his fame that Governor Clinton, in that year, invited him to deliver a course of lectures before the New York State Legislature. It actually happened! And, more than that, this course of lectures was one of the chief causes leading to the establishment of the State Geological Survey.

My story grows stranger and more interesting. Did you ever hear of an inmate of a state prison becoming the chief source of inspiration to a great scientist? In 1810 one William Torrey was appointed fiscal agent to the state prison at Greenwich, now Greenwich Village, a section of lower New York City. William's young son, John Torrey, attracted the attention of one of the inmates, who had been imprisoned for debt. That inmate was the same Amos Eaton who later, by his eloquence, helped inspire the Legislature to take the first step that led to the establishment of this Museum. It was from Eaton that John Torrey got his first inspiration for a scientific career. He became the State's first Botanist.

## Excerpts from Convocation Addresses

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### REGIONAL SURVEY: SCIENCE FOR CITIZENSHIP

LEWIS MUMFORD, AUTHOR, NEW YORK CITY

Among all the grave conditions that our society faces today, one of the worst is the fact that the increase of scientific knowledge and rational insight has not in itself created a more rationally ordered world. On the contrary, just the opposite of this has happened.

This outcome was not foreseen either by the thinkers and statesmen who laid the foundations for political democracy, nor by the scientists who, absorbed in their special researches, implicitly believed that their activities must contribute to the relief of man's estate. The first group believed that all government rested on the rational consent of the governed: when they widened the ballot, they assumed that the intelligence and discretion necessary to its use were implanted in all men, or capable of being sufficiently developed by education. The second group believed that the extension of the experimental method to every department of thought would cast a wider and wider cone of light over the entire field of man's affairs, so that ultimately no phase of life would be untouched by positive knowledge: rather men would utilize science for their common political advantage as readily as the buyers and sellers in the marketplace utilize the abstract laws of arithmetic.

Why have these expectations, which seemed so natural, so just, so inevitable a century ago, miscarried? And what is needed, both in science and in government, if science is to lend itself to the creation of an ordered world; if the citizen is to utilize science, as a practical method and a moral discipline, in the conduct of his political life? An answer to this question is that faults of commission and omission have existed on both sides. If on one hand we have created a political order that has only partly, and very reluctantly, admitted, outside perhaps medicine and engineering, the functional authority and inherent right to exact

*Lewis Mumford*

obedience that valid science carries with it, on the other hand we have had a science that remained divorced from the totality of human experience.

Ever since Pythagoras and his followers began to dream of the enlightened governance of human affairs through science men have from time to time realized that there is an essential relation between orderly thought and exact knowledge, and an orderly political and social existence. In the years that have passed, the specialized triumphs of science have been many, and the sciences have spread over a vast area of inquiry. But we must not deceive ourselves as to either the depth of insight or the breadth of application that accompanies this spread of science. Even among those who devote themselves most sedulously to science as a profession, and who employ its characteristic methods and technics every day, there is a serious failure to connect with society as a whole, or to see the sciences themselves, as a body, in such a ramifying interrelationship as they actually have in their relations to society. Outside his own minute specialism, even the most distinguished scientist has now become an amateur. And only the most tenuous filament connects the specialized world of science with the curiosities and admirations and desires and hopes that prompted men originally to the self-abnegating discipline of scientific investigation, with its collaborative experiment, its publicized and verifiable truths.

We have now reached a point in the development of knowledge itself at which no single mind is capable of grasping, even extensively, the sum of all its special investigations. What is needed, if the sciences are to become intelligible, both to each other and to the great body of men who live under their dominion, is some common fundamental means of approach.

Synthesis can not result as a mere addition of specialism: the result of such an attempt, even if successful, would merely be to create another specialism. Synthesis must begin with a common frame of reference and a common process of investigation, at the beginning, so that at every stage in the study or application of a science, the facts of a common interest, a common field, a common sphere of interrelatedness and a common area of application shall be uppermost.

During the last generation a new movement toward synthesis both in science and in society has been gradually taking shape. This movement first took place in the biological sciences; but it arises, not out of the usual attempt to reduce the complex to its more simple elements, but out of a recognition that the facts of society have a universal import: we do not know the whole truth about any particular fragment of the universe, about any particular phase of experience, about any particular aspect of reality, until we know it in its social relations, as part of a functioning whole. The scientific branch of science in which this social point of view was first achieved was ecology: but the recognition of interrelated and integrated wholes has made its way independently into the thought of the last generation at many points.

The notion of an ecological approach to synthesis is not indeed a new one. Perhaps the most successful expositor of science, among a race of great lecturers and demonstrators, was Thomas Henry Huxley. A later generation of scientists in England, headed by one of Huxley's brilliant pupils, the late Professor Sir Patrick Geddes, applied Huxley's method to the systematic study of a whole region, considered not solely as a geographic area but as a theater of human activities. By taking the region as a whole as a field for scientific investigation and interpretation, Geddes suggested, the necessary unity between the sciences

could be partly achieved: they would have a common focus and a common task — that of applying their exact specialized knowledge to the effective comprehension of the life of a region in its totality.

Geddes called this method of focussing and correlating the outlooks and methods of the various sciences the regional survey.

About such a survey there are two main facts that distinguish it from purely verbal or schematic attempts at synthesis. The first is that the introduction to the sciences comes directly from the observation of, and from participation in, the activities of men and nature.

There is another important attribute of the regional survey that distinguishes it from more specialized kinds of field study. Each part of the environment, even when studied momentarily by itself for the sake of clarity and orderly definition, is correlated with every other part of the environment.

Finally, let me call attention to one further fact about the regional survey that distinguishes it from more partial field studies: it includes the facts of man's life and the activities of the human community as equally subject to the systematic scrutiny of science.

Plainly, not every one has the capacity to participate in specialized scientific research, still less to reach one of the higher rungs of the ladder in a particular field. But every citizen should have, as an elementary foundation for the common life, this opportunity to explore systematically the regional environment and to participate in the making of a common record of his explorations. One can not start too young in such a survey; one can not push it too far or carry it on too long: the deepening and widening awareness of the environment — taking environment in the broadest sense — is the foundation for the individual's fruitful development in accordance with discipline aims and humane purposes.

What we need, if our democracy is to become a working reality once more, is a whole generation trained systematically to deal with the many-sided realities of modern life. We must have a whole community, imbued from childhood with the essential methods of science, and educated, far better than most scientists themselves have been, to deal with a complicated and interrelated mass of activities: people who will think regionally and think communally, because they have had from childhood on an opportunity to explore and work in and understand every part of their region. This can not be achieved by an extra course in General Science; it can not be achived by an occasional field trip: rather, every part of our educational routine must be revised until the world of knowledge itself is sufficiently unified to be a coherent and clarified reflection of the world which is understood and will in turn be modified by that knowledge.

Hitherto science has been valued by the man in the street as a form of magic. The plain man presses a button and lo! there is light; he pulls a lever, and lo! sixty horses rush to his service, to pull his chariot. In all these great mechanical triumphs, the people who enjoyed the fruits of science and invention were in the main passive: they could stare and wonder; they could purchase and use; but they had little to do with either the conception, the method, or the final result. Not so with the utilization of science through the regional survey: for here is a field that demands that enlarged participation and the continuously expanding understanding of the man in the street.

In the very foundation of The University of the State of New York, the State recognized that the systematic exploration of the environment is one of the provinces of the specialist: hence the admirable series of geologic and botanic surveys made by the institution whose inception we are here celebrating. The time has now come to lay down a new rationale of study, in which the region itself will be the common locus of the work of the school and the applications of the laboratory and the study, and in which the very core of educational activity will be the understanding and the development of the region.

Regional survey: regional planning: regional development: these are three phases of a single process, and once the citizen's approach to science and to his community is made through this common avenue, he will cease to be a bewildered, half-neurotic creature, living in a mysterious, unintelligible, and therefore uncontrollable world. He will rather have, for the first time, the means of acting as a responsible citizen, in an orderly world, toward whose humanization and control he himself has a direct contribution to make.

# THE RELATION OF ELECTRICITY TO SOCIAL POLICY

DR ARTHUR E. MORGAN, CHAIRMAN, TENNESSEE VALLEY AUTHORITY

Technological advance is compelling all peoples to expand the range and the functions of public activities. Power will assume its place as one of the major factors in that great social revolution that is working its way in the world. Here in America we have the problem of how to define the place of electric power in social policy. That issue is pressed upon us in two or three different ways. One is that electricity, almost of necessity, obtrudes itself as a factor in the work that we must undertake. Government is growing in its dimensions, in the quality and the size of its undertakings.

Here in America our undertakings to control our water resources have exhibited that process of growth and we are reaching undertakings of such dimensions and of such complexity that they can be handled properly only by government. One of the pioneer projects in that new movement was the building of Boulder Dam, the greatest structure of its kind in the world, built not for a single purpose, but for several purposes. It was very greatly needed to insure a supply of water for irrigation. It was very keenly needed to control floods. It was needed to increase the water supply of distant cities. While those objectives were being secured that great dam stored the water that would produce vast quantities of electric energy.

In the Columbia River basin we have another great project with more than one purpose. A third public project is that of the Tennessee Valley Authority, an undertaking for the unified control and development of a river system draining an area almost the size of England. We are developing that region, by a single coordinated plan, for navigation, for flood control, for power, for facilities for recreation, for industrial water supply and for other minor purposes. It would be an unjustified social waste to build great structures for a single purpose or to leave other purposes unfulfilled.

Power comes on the scene, in America particularly, as one of the inevitable elements of these great projects for conserving our natural resources, and we have the problem of relating those resources to sound social policies. In a project like the Tennessee Valley Authority the best results will come if we can see that

*Dr Arthur E. Morgan*

entire project with all its implications in good proportion without any element being overemphasized or underemphasized. However, human affairs seldom move with that perfection of balance and it is usually true that some dominant issue takes public attention for the time being even though it is not intrinsically the most important issue. The power factor in the Tennessee Valley Authority has taken public attention in that way, although as the years pass and better proportion is gained it may have a different aspect. It is quite natural, however, that today power should be the dominant factor in the public mind because of all the influences that are working upon human life to change its tempo, to change the physical environment, few are destined to play a bigger part than electric power. It is destined to play a great part in the home. On the farm electricity promises to be an even greater boon than in the urban home.

For the first time in the history of mankind we are facing a time when perhaps we shall have as much power as we know how to use. We may for a short time have a superabundance. I sometimes think that from the standpoint of national destiny, national policy, little could happen which would be so propitious

as a great surplus of electric power because it will of its very presence create new industries. With this development of a great new unprecedented resource for man, government does well to take such proper steps as it can to insure that this force shall realize its full possibilities without exploitation, without waste and especially without a long lag.

Practically all of the major governments have recognized that power is a public, and not a private business; that its generation, transmission and distribution require the powers of government for their exercise, require the right of eminent domain, require the power monopoly which is conferred by government. In the United States, abuses of the power industry have been great and have clearly needed correction. There must be two elements in the lasting solution of the power issue. First, there must be courageous, aggressive and persistent facing of abuses with the determination that they shall be removed. The second necessity is the application of inventiveness and patience without resentment or prejudice, to work out suitable methods. In my opinion, neither private industry, as we know it in the electric power field, nor public ownership, as we know it, is fully satisfactory. Both public ownership and private ownership have very great contributions to make and we would be unwise to lose the contribution of either of them by giving up one for the other.

The Tennessee Valley Authority is an undertaking promoted by the national administration to be an experiment and a contribution to the field of democratic government in electric power. Let me mention some of the possibilities which may well be explored in the power field. First, there can be a steady narrowing of abuses in the private power industry by legislation and supervision. Second, cases of public ownership are desirable at least as a laboratory in effective methods. These may be ownership of generating facilities only, or even of the dam and reservoir, as in the case of Boulder Dam where power is generated by customers, whether public or private organizations, who install generating equipment in the public power house. It may be ownership of distribution facilities alone, as where a city buys power from a private source and distributes it as a public operation; or it may be the ownership of both generating and distribution facilities. Another method is that of electrical cooperatives. Then we have the possibility of power pools. A power transmission pool would be an organization formed to own and operate transmission lines. It would purchase power that is generated at any suitable source, either by public or private organizations, and then would transmit and sell that power, sometimes to public distributors, such as cooperatives or municipalities, and sometimes to private distributors, such as local power companies. Another method is that of joint public and private ownership, such as we observe in Switzerland where a corporation will have a board of directors, part of whom are appointed by public bodies, and part of whom are appointed by the stockholders who have investments in the organization. Another factor that can enter into the solution of this problem is that of gradual improvement of standards of morale in both public and private life, so that there can be a constant comparison of the service rendered by the public serving itself with the results where the public is being served by private organizations.

Another element in the solution of the issue is in the general development of the methods of democratic government and of the quality of administration in public life, with the attitude of open-minded critical inquiry taking the place of partisanship. We see that attitude emerging in the administration of the power industry in Switzerland and to some extent in Sweden.

At all times we need to keep in mind that technical developments may be in the offing which may so change the character of the power industry that great power monopolies may fade away and be no more menace than the street car monopolies have been since the dominance of the automobile. I think the problem of good government and the problem of eliminating exploitation or privilege will remain long with us, much longer than the power issue. In our efforts by short cuts to win a battle over what may be a temporary issue, we must not lose sight of those long-time values of integrity and openness in government and in business. This applies to both sides of the power controversy; to those who would eliminate private abuses and to those who wish to protect the private interests which they represent

# SCIENCE AND DEMOCRACY

WALDEMAR B. KAEMPFFERT, SCIENCE EDITOR, NEW YORK TIMES

Science and democracy are intimately related because they both sprang out of the same necessities. Democracy as we know it has arisen out of the needs of a growing merchant and industrial class, which made feudalism impossible.

It is a characteristic of trade that it deals with all men on the same basis. Business is essentially democratic. With the rise of a merchant and an industrial class it was inevitable that there should also be a rise of democracy. And because the triumphant merchant, manufacturer and miner needed the scientist in furthering trade science rose with democracy.

Nothing irritates the laboratory recluse more than to be told that when he blasts open an atom to find out how matter is put together or determines how cells reproduce or decides that the universe is finite and closed rather than infinite and open, he is engaged in work that has a hard, practical value, even a commercial value. He glories in what seems to him the utter uselessness of his findings to the market place. And yet he is but responding to the intellectual and practical needs of a democratic society of tradesmen, manufacturers, miners and farmers.

Consider Joseph Henry. Not since Franklin's time had any scientist appeared in the United States with his insight, his rare experimental skill. He made an electromagnet, huge for its time, invented the first telegraph in which electromagnets were incorporated, and discovered electromagnetic induction independently of Faraday.

Like Faraday, Joseph stood absolutely aloof from commerce, refused to patent inventions of great value.

Yet this altruistic Joseph Henry was the unwitting tool of democracy and commerce. Every one of his discoveries, all the work that he directed for the Smithsonian Institution was of economic importance. Navigation, agriculture, meteorology, fog-horn acoustics, ballistics, strength of building materials — it was such practical, commercial things that he touched and improved.

Viewing the great scientific discoveries in this social aspect we must conclude that always

*Waldemar B. Kaempffert*

they were made under social tension, that always they satisfied some hidden practical need of the time.

Freedom is relative. These great discoverers and experimenters were not absolutely free, because, as we have seen, they responded to the social tension of their time. But they were members of a democratic society that believed in following its own impulses. No one told them what to think about the stars, or about cells, or about atoms. They had precisely the same kind of freedom that painters, writers and composers of music have.

Today this freedom of scientific men is threatened because democracy is threatened. At no time in the last 2500 years has any western government claimed for iself so complete a jurisdiction over men's minds, lives and behavior as that which totalitarian states now attempt to exercise.

What has happened in Germany? A doctrine of "racial purity" has been promulgated though there is no pure race on the earth today. If any German anthropologist dares to deny that the blue-eyed, long-headed blonde Nordic, who by no means typifies a modern German, is not the intellectual, moral and physical superior of all other types he will find himself in a concentration camp. As might be sup-

posed, the Japanese resented the German doctrine that only blue-eyed, long-headed blondes were fit to rule the earth. So did the southern Alpines of Bavaria. Now the instructions have gone forth to dwell not so much on the physical type as on the mythical German soul.

In Italy Mussolini has insisted on more than one occasion that a man engaged in research must be a good fascist first and a good scientist second, which means that if his science conflicts with fascistic beliefs he must be sacrificed.

In Soviet Russia there was recently a debate between the geneticist Vavilov and the plant-breeder Lysenko. Vavilov preached the doctrine so familiar to all of us, that we inherit certain fixed traits from our ancestors, that a human stock is good or bad, depending on its genes. His opponent, Lysenko, held this up to scorn, not because it was scientifically wrong, but because it conflicted with the egalitarian doctrines of Karl Marx.

Science is obviously in peril because democracy is in peril. If one falls the other falls. Hence the critical importance in social experiments in which Great Britain and the United States are now engaged. On both sides of the ocean an attempt is being made to adapt democracy as we know it, a social and political conception of the 18th century, to a society which has been highly mechanized and which presents problems of totally different order from those that confronted the liberals of the past. Some European countries have decided that the democratic form of government can not cope with the intricate problems that have been created by scientific progress. If this is true a culture based on democratic science is destined to go the way of the great cultures of the past.

I do not maintain that we would have no science at all without democracy, but I do maintain that the pace of scientific progress so characteristic of our era was possible only in our type of democratic society, that some scientific theories would never have been uttered under a despot, that some branches of science would never have been developed.

Science is not merely a body of discoveries and inventions. It is an attitude of mind. It is the right to assume this attitude that must be preserved. Professor Alfred North Whitehead calls it the most significant thing that has ever happened to the human race — this self-effacing attitude. If democracy is to save itself that attitude must become part and parcel of our general thinking.

It is because of this attitude that science is democratic. It knows no creed, no country. If this democratic internationality is to be preserved the scientific worker can no longer stand aloof. If democracy is to be saved it must be with the aid of science. By this I mean that the scientific objective attitude must rule in place of the political attitude. It so happens that the problems of our time are largely scientific and engineering problems — problems in public health, problems in distributing populations, problems in preventing overcrowding, problems that arise out of a falling birthrate. There is every reason, then, why the expert in science should be heard in Congress.

Perhaps because they are nearer the volcano than we are British scientists are taking steps to enter the social arena. They have become aware of their social responsibilities.

This is something new in science. Hitherto it has been content to follow merely the trend in research, ignoring the social reason for the trend. Now it realizes that it can direct that trend and by directing it enable democracy to fulfil its aspirations. It is an omen, a sign of hope — a sign that science itself realizes its danger — realizes, too, that never was there a time when it had so vital a message to deliver, so high a social mission to perform.

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